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IN TWO SECTIONS

Section I

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IN THIS ISSUE

Cost Estimating for a Trucking Company,
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EDITORIAL DEPARTMENT NOTE

Cost estimating combines the techniques of forecasting, cost accounting and pricing. Forecasting must be applied to arrive at the expected conditions upon which the figures are to be based. Cost accounting methods are needed in assembling and analyzing the figures. And finally, pricing policies are applied since, in the usual case, the object of cost estimating is to arrive at a price to quote to a prospective customer. We usually think of cost estimating as applying only to those industries which manufacture to customers' orders and specification. But even in companies manufacturing to order, selling prices are often determined in advance of manufacture, and cost estimates in the form of standard costs or past costs adjusted for forecasting future conditions are needed if prices are to be related in any way to costs. This applies as well to companies supplying services as to companies manufacturing goods. The article in this issue of the BULLETIN is a cost study, showing how cost estimating is applied in arriving at a contract price in the trucking industry.

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COST ACCOUNTANTS

NOVEMBER 15, 1938

COST ESTIMATING FOR A TRUCKING COMPANY

By George P. Cormack,
Office Manager, C. S. Borggaard, Somerville, Mass.

Foreword

DEVELOPMENTS in transportation by motor truck during recent years have taught business executives that freight distribution by truck is a highly specialized field, best handled by companies who can devote their entire time and energy to a solution of its problems. With this thought in mind, the ABC Stores, Inc., called in the XYZ Transportation Company, furnished them with certain information in regard to their distribution problem, and requested an analysis of their trucking requirements.

This paper shows the method used by the XYZ Transportation Company in analyzing that information in order to develop the rates which were submitted in response to that request.

ABC Stores, Inc., supplied the following information:

1. There are ninety-one stores in sixty-nine principal cities receiving freight from a central warehouse.

2. On the average each store is to receive four and one-half tons of freight each week in three shipments of one and one-half tons per shipment. It is understood that this average is variable and that there are peak periods and relatively low periods. Records for the year previous to the date of this report show that within 15 per cent of four hundred tons of freight had been moved each week.

3. They are willing to equip twenty stores in the metropolitan area (within eight miles of the warehouse) with tents so that deliveries may be made in the nighttime, it being understood that keys to such stores remain in their possession except for the duration of the time necessary to deliver loads to such stores.

4. They are willing to have trucks loaded at the warehouse at the truckers' convenience; that is, if it is more practical to load trucks at night, they will have their own checkers and supervisors on hand for night loading.

5. Deliveries must be made by the truckman between the hours of 7:30 A. M. and 6:30 P. M. on weekdays, except

that no deliveries may be made on Saturdays. Exceptions to this rule will be made during peak periods, in which case the managers of individual stores will be notified to be in the store at a specified time to receive a late delivery. This does not apply to stores equipped with tents.

6. The trucker will be charged with all shortages and credited with all returns at cost except on deliveries to stores at night (those stores which are equipped with tents).

As requested, the XYZ Transportation Company submitted the following analysis:

Analysis—Equipment to Be Used

Exhibit 1 describes the kind of equipment to be used. There are three kinds of trucks represented. The eight-ton (registered capacity) trucks would be used within a twenty-mile radius. The

EXHIBIT 1
EQUIPMENT

	8-Ton (Regis. Cap.) Truck	*Light Tractor*	*Heavy Tractor*	*Trailer*
Chassis Cost	$1,900.00	$1,020.00	$3,656.00	$1,260.00
Refrig. Body	675.00	.....	.....	745.00
TOTAL COST	$2,575.00	$1,020.00	$3,656.00	$2,005.00
Deduct				
Cost of Tires (less 25%)	407.00	244.00	372.00	248.00
CAPITALIZED EQUIP. COST	$2,168.00	$ 776.00	$3,284.00	$1,757.00
Years of Life	3	3	5	8
Yearly Depreciation	723.00	258.00	657.00	219.60
Yearly Cost of Repairs	250.00	300.00	200.00	100.00
Tire Size	34 x 7	34 x 7	900–22	900–22
Tire Cost per Set	542.00	325.00	496.00	330.00
Tire Life (miles)	25,000	25,000	30,000	30,000
Tire Cost (per 100 miles)	2.17	1.30	1.65	1.10
Yearly Mileage of Trucks	20,000	30,000	50,000	.....
Truck Specifications				
Manuf. Rating	8,000 lbs.	6,000 lbs.	7,000 lbs.	24,000 lbs.
Load Capacity	16,000 "	12,000 "	14,000 "	8,000 "
Wt. of Truck	8,000 "	4,000 "	7,000 "	4,000 "
Total Reg. Wt.	24,000 "	16,000 "	21,000 "	12,000 "
Body Dimensions	7'x7'x18'			7'x7'x22'
Special Equip.		Ruxtel Rear-end		
Gasoline M.P.H.	5	4½	6	..

light tractors with semi-trailers would be used within a fifty-mile radius. The heavy tractors with semi-trailers would be used within a one-hundred-and-fifty-mile radius. The choice of truck to be used may be disputed, but it is sufficient to say that the greater the cost of the equipment, the longer will be its life.

It is a self-evident truth that in the final analysis heavier equipment is not more expensive. Although the original cost may be greater, the prolonged life of the truck and smaller cost of repairs equalizes the final cost. On long hauls it is imperative to use heavier equipment.

Refrigerated or insulated bodies are specified for all trucks because the merchandise is semiperishable; the use of such bodies is necessary in two summer months and three winter months on long hauls; the bodies may be securely locked so that loss from petty thievery is avoided. The additional equipment cost for such bodies is minute in comparison with the cost of other type bodies. For example, whereas a refrigerated body may cost $675, a semi-van (open top) body for the same chassis would cost $435. The additional cost of the refrigerator body is $240. Over a period of four years (the life of a truck) this is resolved into a yearly cost of $60. Again resolving this into an hourly cost on the basis of 2,600 working hours per year, we find that the additional cost is only $.023 per hour. The cost of dry ice to keep the truck refrigerated in summer months is negligible. In addition to this the time saved in unloading would offset the original cost since it takes at least ten minutes at each stop to tie and untie ropes and canvas.

Exhibit 2 also shows the original cost of equipment and its yearly cost. The cost of tires is deducted because that cost is a mileage cost and is considered separately.

Yearly Equipment Costs

The costs shown in Exhibit 2 are of a fixed nature. Depreciation is on a straight-line basis over the estimated life of the truck. Repairs are estimated on an experience basis over a number of years and with due regard for the estimated yearly mileage of each truck. We believe that these estimates are high, and purposely so; there is a margin of safety included.

Insurance is shown at annual rates for the year in which this

EXHIBIT 2

ASSEMBLED YEARLY EQUIPMENT COSTS

	8-Ton (Regis. Cap.) Truck	*Light Tractor*	*Heavy Tractor*	*Trailer*
Depreciation	$ 723.00	$ 258.00	$ 657.00	$219.60
Repairs	250.00	300.00	200.00	100.00
Insurance				
Load	20.00	20.00	20.00	.....
Fire and Theft	31.67	12.15	44.96	24.60
Collision	50.00	26.00	195.00	88.50
Pub. Liab.	199.42	135.87	155.87	171.46
Prop. Dam.	147.00	131.00	141.00	155.10
Work. Comp.	100.45	112.00	115.00	.....
Taxes	15.00	6.00	20.00	10.00
Registration	36.00	24.00	31.50	18.00
Public Util. Permits	2.00	2.00	2.00	2.00
Garage	10.00	7.00	7.00	5.00
Int. on Invest.	154.50	61.20	219.36	120.30
TOTAL	$1,739.04	$1,095.22	$1,808.69	$914.56
Cost per Hour (2,600 hours per year)	67¢	42¢	69¢	35¢
Cost per Minute	1.11¢	.7¢	1.15¢	.58¢

EQUIPMENT NECESSARY (See Exhibit 9)

Truck Nos.				
1-2-3	Heavy Tractors	3 @	$1,808.69	$5,426.07
4-5	Light Tractors	2 @	1,095.22	2,190.44
	Trailers	5 @	914.56	4,572.80
6-7	8-ton Trucks	2 @	1,739.04	3,478.08
	TOTAL YEARLY EQUIPMENT COSTS			$15,667.39

report was compiled. Taxes are estimated, but the basis is $40 per thousand dollars of assessable value, averaged over the estimated life of each truck. Registration is at actual cost, as is the cost of public utility permits. Garage expense is considered normal. Interest on capital investment is included as a matter of cost record.

Equipment costs are distributed on an hourly basis. Since it is a premise that deliveries may be made on five days each week and approximately ten hours each day, the supposition is made that the total working hours for each truck will be 2,600 hours per year.

Labor

Union wages begin at $33 per week of forty-eight hours for drivers of small trucks and go to $37 per week of forty-eight

hours for drivers of large trucks. Union regulations call for a day of not more than eight hours with time and one-half pay for overtime. We have arranged our schedules for this work so that drivers may be changed often enough to eliminate runs of more than eight hours whenever possible. The labor costs are shown in Exhibit 3.

EXHIBIT 3

LABOR

	Weekly Rate	*Rate per Hour**	*Rate per Minute**
8-ton Truck	$36.00	$.75	$.0125
Light Tractor and Semi-trailer	40.00	.85	.01425
Heavy Tractor and Semi-trailer	40.00	.90	.015

* Rates per hour and per minute are slightly higher than the base weekly rate to allow for necessary overtime.

Mileage Costs

Three factors enter into mileage costs: gasoline, oil and tires. These are shown in Exhibit 4.

Gasoline at the terminal has a relatively low cost. Some gasoline must be purchased on the road. That amount is approximately one-third of the total quantity consumed. A truck which runs 5 miles to the gallon will use 200 gallons per 1,000 miles. Gasoline cost per mile is calculated as follows:

67 gallons gasoline on the road @ 18¢	$11.06
133 gallons gasoline at terminal @ 13¢	17.29
	$29.35

$$\frac{29.35}{1{,}000} = .02935 \text{ gasoline cost per mile.}$$

Oil is changed each 1,000 miles. The cost is approximately $.15 per quart. This cost is so small that it has been included with the cost of gasoline.

Tire costs are calculated on the mileage basis shown. These bases are the result of experience. Original cost of tires is taken to be the list price of a standard make of tire. Although it is recognized that tires may be, and in fact are, purchased at a discount off such list prices, the differential approximately equals the cost of repairs to the tires throughout their life.

EXHIBIT 4

MILEAGE COSTS

COST OF GASOLINE AND OIL

Average cost of Gasoline and Oil..... .15 per gallon

8-ton Truck averages	5 miles per gal.	= .03	per mile
Light Tractor averages	4½ miles per gal.	= .033	per mile
Heavy Tractor averages	6 miles per gal.	= .025	per mile

COST OF TIRES

$$\frac{\text{8-ton Truck Tires cost \$542.00}}{\text{Average Mileage 25,000}} = .022 \text{ per mile}$$

$$\frac{\text{Light Tractor Tires cost \$325.00}}{\text{Average Mileage 25,000}} = .013 \text{ per mile}$$

$$\frac{\text{Heavy Tractor Tires cost \$496.00}}{\text{Average Mileage 30,000}} = .0165 \text{ per mile}$$

$$\frac{\text{Trailer Tires cost \$330.00}}{\text{Average Mileage 30,000}} = .011 \text{ per mile}$$

TOTAL MILEAGE COSTS

	Gas. and Oil	*Tires*	*Total*
8-ton Truck	.03	.022	.052
Light Tractor and Trailer.....	.033	.024	.057
Heavy Tractor and Trailer.....	.025	.0275	.0525

Warehouse Labor Costs

Four and one-half tons of freight are shipped to each of ninety-one stores in each of fifty-two weeks in the year, a total of 409.5 tons per week or 21,294 tons per year. Two men would be assigned to the loading platform. They would work 48 hours each week or a total of 4,992 hours per year. Their rate of loading would have to be 4.26 tons per man-hour to load all the freight on the trucks. We believe this rate of loading to be low. The rate of loading this merchandise would probably be nearer 6.0 tons per man-hour. Therefore, they have a time allowance of approximately 30 per cent. Necessary delays between loads and the unloading of returned salvage will account for most of that time allowance.

There is no factor in warehouse cost which is affected by the distance the freight is to be moved or the time it takes to move it. Therefore, we have distributed warehouse cost on a per-ton basis as shown in Exhibit 5.

EXHIBIT 5

WAREHOUSE LABOR COSTS

	Per Year
Foreman	$1,750.00
Loader	1,500.00
TOTAL	$3,250.00

TONNAGE

409.5 ton per week × 52 weeks = 21,294 ton per year

$$\frac{\$3,250.00}{21,294} = \$.153 \text{ per ton}$$

Overhead

Overhead consists of that kind of expense which is not directly chargeable to the individual trucks or to the handling of the freight. We have assigned to the work that proportion of the office expense, shop expense and supervision expense which this part of our work will bear to the total work we do. Office expense includes office salaries, office rent and general office expense; shop and garage expense includes the wages of washers and greasers of the trucks, small tool expense, shop equipment depreciation, shop rent, service car expense, miscellaneous insurance, miscellaneous taxes, watchman's wages, and general shop expense. Supervision expense represents that proportion of the salaries of foremen which would be applicable to this work.

Overhead is distributed on the basis of truck-hours in operation as shown in Exhibit 6.

EXHIBIT 6

OVERHEAD

	Cost per Year
Proportion of Office Expense	$1,350.00
Proportion of Shop and Garage Expense	3,500.00
Supervision Expense	2,500.00
TOTAL	$6,850.00

TOTAL TRUCK-HOURS PER TRIP

$$118 \times 3 \times 52 = 18{,}408 \text{ Road Hrs. per year}$$

$$\frac{\$6,850}{18,408 \text{ Road Hrs.}} = \$.372 \text{ Cost per Road Hour}$$

$$\frac{.372}{60} = \$.0062 \text{ Cost per Minute}$$

Rates

Exhibit 7 is an example of the method of distributing to each load and to each store the total costs of the load, finally arriving at the rate per hundred-weight for each store. Similar tables are prepared for each of the fifteen routes.

Road travel time is taken as follows:

2-6 miles @ 8 M. P. H.
7-20 miles @ 15 M. P. H.
over 20 miles @ 25 M. P. H.

Travel time shown here is the result of time studies made in actual operation in similar work. It includes the time necessary to back into place at a store for unloading.

Loads on semi-trailers will be 10.5 ton.
" " large trucks " " 7.5 ton.

Mileage in every case is taken as the most direct route over hard surface roads.

To establish the complete method used we will analyze Route #1 (Exhibit 7).

Miles from Warehouse sets up the number of miles each store is distant from the warehouse so that,

Miles Per Cent may be calculated on the supposition that along any route each town should bear that proportion of the mileage and travel time cost that its distance from the warehouse bears to the total of the distances from the warehouse.

Actual Miles Traveled is calculated as the distance the truck travels between stops. The total of this mileage is apportioned to each store under

Corrected Miles on the basis of miles per cent.

Tons per Load are 1.5 each in accordance with the original facts.

Travel Time is calculated according to the table given above and is apportioned under

Corrected Travel Time to each store on the basis of miles per cent.

EXHIBIT 7

Heavy Tractor and Trailer — Mileage Cost .0525 per mile; Time Cost .0323 per minute — Warehouse Cost .153 per ton; Overhead Cost .0062 per min.

	Miles from Warehouse	Miles Per Cent	Actual Miles Traveled	Corrected Miles	Tons per Load	Travel Time	Corrected Trav. Time	Unload Time	Total Time	Mileage Cost	Time Cost	Warehouse Cost	Overhead Cost	Total Cost	110 Per Cent	Rate per Hundred lbs.
Route #1 Boston																
Pittsfield	145	.19	145	56	1.5	320	141	23	164	2.94	5.33	.23	1.02	9.52	10.48	.35
Pittsfield	145	.19	2	56	1.5	15	141	23	164	2.94	5.33	.23	1.02	9.52	10.48	.35
Westfield	99	.14	46	42	1.5	110	105	23	128	2.21	4.13	.23	.79	7.36	8.10	.27
Westfield	92	.12	7	37	1.5	42	91	23	114	1.94	3.68	.23	.71	6.56	7.22	.24
Springfield	90	.12	2	35	1.5	15	90	23	113	1.84	3.65	.23	.70	6.42	7.06	.23
Springfield	90	.12	2	35	1.5	15	90	23	113	1.84	3.65	.23	.70	6.42	7.06	.23
Springfield	90	.12	2	35	1.5	15	90	23	113	1.84	3.65	.23	.70	6.42	7.06	.23
Boston	..	..	90	..	..	216	..	..	..	..	..	..	..	..	..	..
TOTALS	751	100	296	296	10.5	748	748	161	909	15.55	29.42	1.61	5.64	52.22	57.46	.27

Unload Time is calculated at 4 ton per hour.

Total Time is the total of corrected travel time and unload time.

Mileage Cost is the result of the multiplication of corrected miles by mileage rate (Exhibit 4).

Time Cost is the result of the multiplication of total time by the truck rate per minute (Exhibit 3) plus the labor rate per minute (Exhibit 4).

Warehouse Cost is the result of the multiplication of the tons per load by the warehouse labor cost (Exhibit 5).

Overhead Cost is the result of the multiplication of the total time by the overhead rate per minute (Exhibit 6).

Total Cost is the summation of the four costs.

110 Per Cent. We propose to calculate rates on cost plus 10 per cent, therefore we make this calculation based on total cost.

Rates. The rate to each store equals 110 per cent divided by the hundred weight carried.

In Exhibit 8 is given a recapitulation of the total costs by routes and the total cost per year. The average rate per hundred-weight is $.137.

EXHIBIT 8

RECAPITULATION

Route	*Total Miles*	*Total Min.*	*Time Hrs.*	*Total Cost*	*110%*	*Yearly Charge Per Route*
1	296	909	15.15	$52.22	$57.46	$8,963.76
2	225	844	14.07	45.92	50.51	7,879.56
3	199	786	13.10	42.35	46.49	7,252.44
4	97	513	8.55	26.45	29.06	4,533.36
5	76	476	7.93	21.76	23.92	3,731.52
6	97	509	8.48	24.01	26.44	4,124.64
7	81	513	8.55	23.24	25.57	3,988.92
8	125	593	9.55	27.86	30.73	4,793.88
9	25	275	4.60	10.75	11.82	1,843.92
10	20	260	4.33	10.03	11.04	1,722.24
11	24	273	4.55	10.64	11.69	1,823.64
12	27	319	5.31	12.19	13.41	2,091.96
13	18	244	4.07	9.47	10.42	1,625.52
14	27	285	4.75	11.16	12.26	1,912.56
15	35	290	4.83	11.72	12.89	2,010.84
	..	7,089	117.82	$339.77	$373.71	$58,298.76

Routing

Exhibit 7 shows the beginning of the routing system. In that exhibit the route is taken as the most advantageous grouping of towns and cities by sectors to cut the time and mileage factors down to the lowest possible degree. A little study of the possibilities involved will quickly show that unless the trucks are efficiently routed, time and mileage, and consequently money, is lost each day.

Exhibit 9 shows the assignment of trucks to routes including the day designation.

EXHIBIT 9

ROUTING

SEMI-TRAILERS		Unit Number						No. of
Route		*M*	*T*	*W*	*Th*	*F*	*S*	*Hours*
Pittsfield	#1		1		1		1	15.15
			2		2		2	
Northampton	#2	1		1		1		14.07
		2		2		2		
Greenfield	#3	3		3		3		13.10
Newburyport	#4		3	4		4		8.55
Gloucester	#5		2		2	2		7.93
Worcester	#6	4	4		4			8.48
Attleboro	#7	2		2	3			8.55
New Bedford	#8	5		5		5		9.55
Units in Use		5	4	5	4	5	2	85.38
TRUCKS								
Route								
Melrose	#9	7		6		7		4.60
Everett	#10	6		7		6		4.33
Belmont	#11*	6		7		6		4.55
Waltham	#12*	7		6		7		5.31
Jam. Plain	#13*	6		7		6		4.07
E. Milton	#14*	6		7		6		4.75
Weymouth	#15	7		6		7		4.83
Units in Use		2		2		2		32.44

* Night deliveries permitted at these stores.

Exhibit 10 shows the daily starting and finishing time of each truck. The loading time and drivers' working hours are also shown. In this exhibit, care had to be taken so that sufficient time allowance would be made (above loading time) to the end that unavoidable delays such as an unusual traffic tie-up would not upset the whole schedule. One extra hour between loads was deemed sufficient.

Exhibit 10
ROUTING TIME

	Trk. #	Rte. #	Load A.M.	Load P.M.	Start A.M.	Start P.M.	Finish A.M.	Finish P.M.	Elapsed Time	Driver No.	Total Drivers Time
Sunday	6	11		1:30-3		7:00	12:00		5	1	5
Monday	7	12		7-8:30S		11:00S	4:30		5½	2	5½
	6	13	12:30-2		2:00		6:15		4¼	1	4¼
	7	9	5-6:30		6:30		11:45		5¼	2	4¾
	6	10	6:30-8		8:15			1:15	5	11	4½
	7	15		12-1:30		2:00		7:30	5½	10	5
	6	14		1:30-3		3:15		8:30	5¼	11	4¾
Tuesday	7	11		1:30-3		7:00	12:00		5	10	5
Wednesday	6	12	7-8:30T			11:00T	4:30		5½	1	5½
	7	13	12:30-2		2:00		6:15		4¼	10	4¼
	6	9	5-6:30		6:30		11:45		5¼	1	4¾
	7	10	6:30-8		8:15			1:15	5	2	4½
	6	15		12-1:30		2:00		7:30	5½	11	5
	7	14		1:30-3		3:15		8:30	5¼	2	4¾
Thursday	6	11		1:30-3		7:00	12:00		5	1	5
	7	12		7-8:30Th		11:00Th	4:30		5½	2	5½
	6	13	12:30-2		2:00		6:15		4¼	1	4¼
	7	9	5-6:30		6:30		11:45		5¼	2	4¾
	6	10	6:30-8		8:15			1:15	5	11	4½
	7	15		12-1:30		2:00		7:30	5½	10	5
	6	14		1:30-3		3:15		8:30	5¼	11	4¾

These are 8-ton trucks on local routes.
Routes 11, 12, 13 and 14 may make night deliveries.
One-half hour extra is allowed on daytime routings.

A calculation of the total loading time shows that the warehouse men work a total of eighty hours, which bears out the supposition regarding warehouse labor.

The total drivers' time on routes is shown in Exhibit 11.

EXHIBIT 11

TOTAL DRIVERS' TIME

Driver No.	*Mon.*	*Tue.*	*Wed.*	*Thu.*	*Fri.*	*Sat.*	*Total*
1	9½		10½		9½		29½
2	10½		9½		10½		30½
3	9		9		8		26
4	9	9		8	9		35
5	7½	7½	7½	7½	7½	7½	45
6	7½	8	7½	8	7½	8	46½
7*	13½		13½		13½		40½
8	10	8	9	9			37
9		9	10	9	10		38
10	5		9½		5		19½
11	9½		5		9½		24
TOTALS	91	41½	91	40½	90	15½	369½

* Under Interstate Commerce Commission Regulations as well as many state laws, truck drivers are not permitted to drive a truck for a period of more than twelve hours in one stretch. This effect could be brought about by decreasing the number of stops per load wherever the natural time consumption exceeds twelve hours.

Payroll

By the application of the total drivers' time in Exhibit 11 to the payroll rates we are able to forecast the weekly and yearly payroll for the truck drivers as shown in Exhibit 12. By no means does this mean that these amounts represent the total of the drivers' wages in any one case. They may and probably would drive a truck on work for another customer to fill out their time. These amounts are that portion of the weekly payroll chargeable to this work.

Proof

We have arrived at rates which may be questioned by other truckmen. It may be said that the work cannot be done at these rates. We ask ourselves, "What items are questionable?" We list those items and explain them:

1. Miles per gallon on the various trucks
2. Time allowances
3. Fixed charge costs
4. Warehouse costs
5. Overhead costs

EXHIBIT 12

DRIVERS WAGES

Driver #	1	2	3	4	5	6	7	8	9	10	11
Week Rate	36.00	36.00	36.00	40.00	40.00	40.00	40.00	40.00	40.00	36.00	36.00
Day Rate	6.00	6.00	6.00	6.67	6.67	6.67	6.67	6.67	6.67	6.00	6.00
Hour Rate	.75	.75	.75	.83	.83	.83	.83	.83	.83	.75	.75
Overtime											
1st Hour	.85	.85	.85	.85	.85	.85	.85	.85	.85	.85	.85
2nd, etc.	1.12	1.12	1.12	1.25	1.25	1.25	1.25	1.25	1.25	1.12	1.12
Total Days	3	3	3	4	6	6	3	4	4	2	2½
Overtime Hours	5½	6½	2	3	..	..	16½	4	6	3½	4
Regular Pay	18.00	18.00	18.00	26.67	40.00	40.00	20.00	26.67	26.67	12.00	12.00
Overtime											
1st Hour	2.55	2.55	1.70	2.55	....	....	2.55	2.55	3.40	1.28	1.70
2nd, etc.	2.80	3.92	....	....	....	....	16.66	1.25	2.50	2.24	2.24
TOTAL PAY	23.35	24.47	19.70	29.22	40.00	40.00	39.21	30.47	32.57	15.52	15.94

TOTAL WEEKLY PAYROLLL..... $ 310.45

TOTAL YEARLY PAYROLL..... 16,143.40

The number of miles a truck will run on a gallon of gasoline is demonstrable. We take these facts from experience. Many trucks operated over many miles under all kinds of conditions gives us these facts.

We are only too well aware that any kind of time schedule is easily upset by conditions which are beyond our control. But such occurances are not daily affairs. In the end, over long periods of time, we know that our time allowances will be approached if not equaled or bettered. In this instance we expect to have the full co-operation of the shipper (as demonstrated by their willingness to equip stores for night deliveries and to facilitate loading). Therefore, we are more than willing to give them the benefit of the best possible time allowance. We are sure that in the final check-up neither will suffer.

To show that the yearly payroll for drivers plus the yearly equipment costs, approximately equals the amount charged for labor and fixed charges under time cost (Exhibits 7 and 8), the following is submitted:

Total time cost (all routes) $201.81 × 156 =	$31,482.36
Total yearly payroll (Exhibit 12)....	$16,143.40
Total yearly Equip. Costs (Exhibit 3)	15,667.39
	$31,810.79
Error	328.43

This error is .62 of 1 per cent of the total cost.

The most easily demonstrable facts in the analysis are fixed charge or equipment costs. The type of equipment may be questioned but not its cost. The rates of depreciation, insurance charges, taxes, registration and garaging are all so high, so complete that they are lifted beyond a shadow of doubt. The only fixed charge factor which can be questioned is repairs. That factor is also taken from experience and we believe it to be correct. In any case that factor is less than 15 per cent of the total fixed charges and but 4 per cent of the total costs; if it were doubled (and that is absurd) the result would be as an increase in total costs of less than one-half a cent per hundred pounds of

EXHIBIT 13

Heavy Tractor and Mileage cost, .0525 per mile
Semi Trailer Time cost, .0323 per minute

Warehouse cost, .153 per ton
Overhead cost, .0062 per minute

	Miles from Warehouse	Miles Per Cent	Actual Miles Traveled	Corrected Miles	Tons per Load	Travel Time	Corrected Trav. Time	Unload Time	Total Time	Mileage Cost	Time Cost	Warehouse Cost	Overhead Cost	Total Cost	110 Per Cent	Rate per Ton Mile
ROUTE # 3 (Same Load per Store)																
Boston																
Greenfield	96	.25	96	49	1.5	230	156	23	179	2.58	5.78	.23	1.11	9.70	10.68	.36
Athol	73	.20	24	40	1.5	72	125	23	148	2.10	4.78	.23	.94	8.05	8.85	.30
Gardner	60	.16	16	32	1.5	60	100	23	123	1.68	3.98	.23	.76	6.65	7.32	.24
Fitchburg	47	.13	13	26	1.5	54	81	23	104	1.37	3.36	.23	.65	5.61	6.07	.20
Leominster	42	.11	5	22	1.5	35	69	23	92	1.16	2.97	.23	.57	4.93	5.42	.18
Ayer	36	.10	9	20	1.5	46	63	23	86	1.05	2.78	.23	.53	4.59	5.05	.17
Concord	19	.05	17	10	1.5	62	31	23	54	.52	1.74	.23	.33	2.82	3.10	.10
Boston	..	..	19	..	..	66	..	...	...	...	...	...	...	...	...	...
TOTAL	373	100	199	199	..	625	625	161	786	10.46	25.39	1.61	4.89	42.35	46.49	.22
ROUTE # 3 (Variable Load for Store)																
Boston																
Greenfield	..	..	..	..	1.5	...	156	23	179	2.58	5.78	.22	1.11	9.69	10.65	.36
Athol	..	..	..	..	1.0	...	125	15	140	2.10	4.53	.14	.87	7.64	8.40	.42
Gardner	..	..	..	..	1.5	...	100	23	123	1.68	3.98	.26	.76	6.68	7.35	.24
Fitchburg	..	..	..	..	2.5	...	81	38	119	1.37	3.84	.54	.74	6.49	7.14	.14
Leominster	..	..	..	..	2.0	...	69	30	99	1.16	3.20	.29	.61	5.26	5.79	.14
Ayer	..	..	..	..	1.0	...	63	15	78	1.05	2.52	.06	.48	4.11	4.52	.23
Concord	..	..	..	..	1.0	...	31	15	46	.52	1.44	.10	.29	2.35	2.58	.13
Boston	..	..	..	..	..	...	...	...	...	...	...	...	...	...	...	...
TOTAL	..	..	..	..	10.50	...	625	159	784	10.46	25.29	1.61	4.86	42.22	46.43	.22

freight. Warehouse costs are high and therefore are impregnable from this standpoint.

We admit to being not too sure of the overhead costs. They will be dictated by necessity and experience. So many unforeseen factors come into them and they are so varied from year to year that we are obliged to admit that this is simply our best guess. What happens if they are too low? We are very sure that "tops" would be $9,000 or an increase in cost of about one-half a cent per hundred. We have endeavored to protect ourselves against such a possibility. See the proposition (page 333).

Conclusions

It is undeniable that rates as low as these can only be extended by the most efficient routing of the trucks. It is easily possible to lose money at these rates if schedules cannot be maintained. Much depends on the co-operation which is extended by the shipper. If loads do not arrive on the shipping platform as scheduled, then trucks are delayed and costs rise at an alarming rate. Insofar as possible, allowance has been made for natural delays.

The facts of the problem assume the most advantageous condition for the determination of rates from the standpoint of weight carried to each store. To show the effect on the rate if the weight to be carried to each store varies, we have in Exhibit 13, the figures for Route #3 with a 1.5 ton load for each store and also with the load varying by stores, but averaging 1.5 tons. It is to be noted that total cost of the route differs by only six cents although the rates chargeable to each store vary greatly.

If the weight to be carried to all stores per trip should drop as low as one ton, then we note a sharp increase in cost of approximately 20 per cent.

That it makes very little difference in cost whether an 8-ton truck or a tractor and trailer is to be used, can be readily demonstrated. Although there is some difference in the rate where lighter equipment is used on long runs, other costs such as repairs and tires would mount and offset the savings. Delays, when they occur, eat into profits prodigiously. The possibility of delays

through breakdowns prohibits the use of light equipment on long runs.[1]

The Proposition

The XYZ Transportation Company proposes that they will agree to transport the merchandise of the ABC Stores, Inc., at these rates provided that:

1. A contract of two years duration shall be signed which shall be binding on both parties.

2. At the end of each six months' period the rates are to be revised as experience and actual costs indicate and in exactly the same manner as the rates have been set up herein. The XYZ Transportation Company will give access to all its cost records to the ABC Stores, Inc., both now and at the time of the rate revisions. In any case the rates are not to be changed more than 10 per cent in the aggregate at any rate revision either up or down, nor are they to be changed more than 15 per cent in the aggregate either up or down from the rates prescribed herein for the duration of the contract.

3. At the end of the two-year period the XYZ Transportation Company shall have the option of continuing to transport the merchandise at the rates offered by the lowest bidder, or at rates set up in the same manner as those described herein, if the ABC Stores, Inc., throws the bidding for the work open to all truckmen and provided that ABC Stores, Inc., has no justifiable cause to complain of the service rendered.

4. At the option of the ABC Stores, Inc., the XYZ Transportation Company will continue to transport their merchandise at rates set up in the manner described herein after the termination of the first contract and a new contract shall be drawn up which will be similar in all essentials to the first contract.

[1] A further comment on the "time" premise upon which this analysis is predicated is given here in an excerpt from the words of one reliable truck operator: " . . . Unfortunately, however, as every truckman has long since learned to his sorrow, there is hardly one shipper in a thousand who will go out of his way to keep a truck operator's truck rolling. The average shipper looks at the truckman's problems with apathy, if not indifference. He feels that it is not part of his job to help the truckman make money. Jurisdictional jealousies creep in, too, and co-operation falls off accordingly. The result is inevitable. Costs rise and the shipper pays the long dollar for his trucking." The author inserts this comment because this estimate was not originally intended for publication. It was designed specifically for a concern whose co-operative spirit is a known factor.